



A.D. 1848. . . N° 12,308.

# SPECIFICATION

OF

JAMES ROBERTSON.

CONSUMING SMOKE, AND REMOVING  
NOXIOUS QUALITIES OF GASES ARISING  
FROM SEWERS, DRAINS, &c.

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ROBERTSON'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I,  
JAMES ROBERTSON, of Liverpool, in the County of Lancaster, Cooper,  
send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her  
5 Royal Letters Patent under the Great Seal of the United Kingdom  
of Great Britain and Ireland, bearing date at Westminster, the Second  
day of November, in the twelfth year of Her reign, did give and  
grant unto me, the said James Robertson, my exors, admors, and  
assigns, Her especial licence, full power, sole privilege and authority,  
10 that I, the said James Robertson, my exors, admors, and assigns, and  
such others as I, the said James Robertson, my exors, admors, or  
assigns, should at any time agree with, and no others, from time to  
time and at all times thereafter during the term of years therein  
mentioned, should and lawfully might make, use, exercise, and vend,  
15 within that part of the United Kingdom of Great Britain and Ireland  
called England, Her Dominion of Wales, and Town of Berwick upon  
Tweed, and also in the Islands of Jersey, Guernsey, Alderney, Sark,



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and Man, and in all Her Colonies and Plantations abroad, my Invention of “**A MODE OR MODES OF CONSUMING SMOKE AND OTHER GASEOUS PRODUCTS ARISING FROM FUEL AND OTHER SUBSTANCES;**” in which said Letters Patent there is contained a proviso requiring that I, the said James Robertson, shall particularly describe and ascertain the nature 5 of my said Invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, to be enrolled in Her said Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said in part recited Letters Patent, as, reference being thereunto had, will 10 more fully and at large appear.

**NOW KNOW YE**, that in compliance with the said proviso, I, the said James Robertson, do hereby declare that the nature of my said Invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the following state- 15 ment and Specification thereof, reference being had to the accompanying Sheet of Drawing hereunto belonging, and forming part hereof, that is to say:—

The mode or modes of effecting the two several objects mentioned in the title of my Invention, one of these being the consuming smoke 20 and other gaseous products arising from fuel, and the other being the consuming the gaseous products arising from noxious or offensive matter in sewers, drains, abattoirs, or other situations where such matter may exist, consist,—

Firstly, in constructing furnaces (for heating boilers or other vessels) 25 with a series of tubes or pipes exterior to the boiler or vessel itself, and arranged or disposed so as to occupy the space ordinarily occupied by the external flues or passages; the said tubes or pipes (and the spaces left in piling them against or over each other) being the course of the smoke, gases, heated air, &c. from the fire or grate to the chimney; 30 and further in supplying with air the smoke or other gaseous products arising from the fuel, whilst such smoke or products (being in a highly heated state, and being divided into small streams by means of the said tubes or pipes) are in a condition to become readily consumed by an intermixture of oxygen from the atmosphere or other source.

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Secondly, in constructing furnaces for heating boilers or other vessels, and also stoves, grates, fire-places, or other similar apparatus for heating buildings, rooms, &c. (by the combustion of fuel) with a series of horizontal or nearly horizontal tubes or pipes placed over or behind  
5 the position of the fuel, such tubes or pipes having an opening or openings on their upper sides or surfaces, and one or both of their ends communicating with the external air, so that in use oxygen from this source may be supplied in a heated or somewhat heated state, and also in thin strata or streams to the smoke and other gaseous products  
10 arising from the fuel, and may effect their consumption by an intermixture therewith, whilst they likewise are somewhat broken up or divided by being obliged to pass on the exterior of and between the said tubes or pipes in their course or passage to the chimney or flue.

Thirdly, in consuming the gaseous products arising from noxious or  
15 offensive matter in sewers, &c., that is to say, in destroying or lessening the noxious or offensive qualities of such said products, by causing them to pass through a series of tubes, pipes, or passages heated for the purpose of producing this effect.

(First Division).—In illustration of the manner in which I carry  
20 into effect the first division of my said Invention, I will refer to the following Figures of the Drawing:—Figure I. is a longitudinal and vertical section through the centre of a furnace constructed accordingly, and for the purpose of heating a cylindrical steam boiler; and Figure II. a perspective view of the interior of the grate or chamber for the fuel  
25 viewed from the front. The corresponding parts in both views are marked with similar letters or characters of reference. *h*, is the boiler; *i*, brickwork of the furnace; *k*, the grate or chamber for the fuel; *l*, fire bars; *m*, ash pit; and *n*, chimney. The whole or nearly the whole of the space or flue between the chimney and the part of the  
30 furnace where the “bridge” is ordinarily situate is occupied by a series of pipes or tubes *A*, placed longitudinally in such space, and piled over and upon each other so as to fill its entire area, such said pipes or tubes and the spaces between them being the course or passage for the smoke, gases, heated air, &c. between the above-mentioned por-  
35 tions of the furnace from the latter to the former. And I prefer to



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construct the said tubes or pipes A of fire-clay, as being a substance which (I believe) retains heat longer than any metal, and will better resist its effects without sustaining injury. They may, however, be made of iron, or other suitable material. B marks a row or series of vertical tubes or pipes (of metal), each having on the side thereof 5 presented towards the tubes or pipes A, a slit or opening, as represented at the Figures III. and IV., which are a side view and transverse section respectively (on a larger scale) of one of such tubes or pipes. Or instead of their being constructed with a slit or opening, they may be constructed with a number of holes or perforations, as represented at 10 the side view and transverse section, Figures V. and VI. respectively; (referring again to Figures I. and II.) the tubes or pipes B are placed about two inches distant from the ends of the tubes or pipes A, and are closed at their upper ends, and open at their lower ends, which are carried down into the ash pit or to the outside of the furnace. Their 15 upper ends may be made to extend to the top of the fire-grate or chamber *k*, or they may be made to extend to only a portion of that distance. Both ways are shewn in Figure II. C is a trap or valve for the admission of air through the opening *p*, to the extremities of the tubes or pipes A nearest the chimney, in order to effect the consumption 20 of any of the smoke or other gaseous products arising from the fuel which may not already have been consumed in its passage through the said tubes or pipes. The air may be admitted, if preferred, from any suitable part of the furnace other than that shewn to the said end of the said tubes or pipes for such purpose. The operation of the furnace 25 is as follows:—The smoke and gaseous products arising from the fuel will pass round and between the tubes or pipes B (and over them if they do not extend to the top), and enter the tubes or pipes A, and likewise the spaces between them, and thus become divided into a series of highly heated small currents or streams. At the same time the 30 atmospheric air entering the tubes or pipes B from the ash pit, or from the exterior of the furnace (these tubes or pipes being in a highly heated state) will become highly heated thereby in its passage through them, and in such condition will pass out of them through the openings in their sides in a series of small currents or streams, and into the 35



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tubes or pipes A. In these tubes or pipes the oxygen of the air thus supplied will unite with and effect a perfect or nearly perfect combustion of the smoke and other gaseous products arising from the fuel ; and I have found in practice that the combustion of such products  
5 produces so great an additional amount of heat as to render unnecessary the combustion of so great a quantity of fuel as is ordinarily the case, whereby a considerable saving is effected, besides the entire or nearly entire consumption of the said products. The whole or a considerable portion of any of such products that may not have become thus con-  
10 sumed in their passage through the tubes or pipes A, will become consumed by the admixture therewith of the additional supply of air introduced through the trap C and opening *p*, or otherwise, as they leave the said tubes or pipes. I would here observe that, although I have represented in the Drawing, and have herein described a series of  
15 tubes or pipes A, as arranged or disposed only in one direct passage between the grate *k* and the chimney *n*, yet in the adaptation of this division of my Invention to furnaces where the ordinary construction of the flues or spaces is such that they have a greater or more extended contact with the boiler or other vessel to be heated, by passing not only  
20 underneath but also along the sides or otherwise before communicating with the chimney, in such cases such said ordinary flues or spaces may either all or only some (as may be desired) be filled with tubes or pipes A. And I would also observe, that although I have represented the tubes or pipes A as being cylindrical in form, and as extending in  
25 length the whole distance between the grate and the chimney, yet they may be of any other convenient form or length ; they may also be of any convenient diameter or transverse dimension. I have found cylindrical tubes or pipes having an internal diameter of three inches to answer exceedingly well. And I would also further observe, that  
30 the tubes or pipes B may be arranged or disposed horizontally, or in an inclined direction, instead of vertically, as above described and as represented in the Drawing.

(Second Division).—In illustration of the manner in which I carry into effect the second division of my Invention, I will refer to the  
35 Figures VII. and VIII. of the Drawing, which are an exterior side



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elevation and sectional front view respectively of a common stove with the horizontal tubes or pipes before mentioned as adapted thereto. And in these said last-mentioned Figures the corresponding parts are marked with similar letters or characters of reference. *r*, is the exterior casing or framework of the stove; *s*, bars; and *t*, the part 5 where a pipe or flue may be fitted on and carried into a chimney or otherwise, as may be desired. The horizontal tubes or pipes referred to are marked B, and extend from side to side of the stove, being open and communicating with the external atmosphere at either both ends or only at one end. These tubes or pipes are made with an opening or 10 openings on one side similar to either of the two plans represented at Figures III., IV., V., and VI., and are so arranged or disposed in the stove that the said opening or openings may be on the upper sides of the said tubes or pipes. The operation of the stove is as follows:— When a fire is lighted, the air in the tubes or pipes B becomes rarified, 15 and a current of air from the exterior to the interior of the stove is consequently induced. In its passage this current of air becomes heated, and on leaving the said tubes or pipes in such condition, and in thin strata or streams, the oxygen thereof unites with and effects the consumption of the heated smoke and other gaseous products arising 20 from the fuel, such products being likewise broken up or divided, as herein-before mentioned. I would here observe, that in ordinary fire-places and in other apparatus where the horizontal tubes or pipes B cannot readily be made to communicate with the atmosphere immediately on emerging from or coming up flush with the exterior casing or 25 framework thereof, that in such cases such said tubes or pipes may be continued beyond the casing or framework in any convenient manner so as to obtain a supply of air, or may unite with each other on the exterior of the said casing or framework, and may obtain the necessary supply from a common chamber furnished with air from any con- 30 venient source.

(Third Division).—In illustration of the manner in which I carry into effect the third division of my Invention, I will now refer to the Figures IX. and X. of the Drawing, which are a sectional side elevation and a front view (having the bars removed) respectively of a stove, 35



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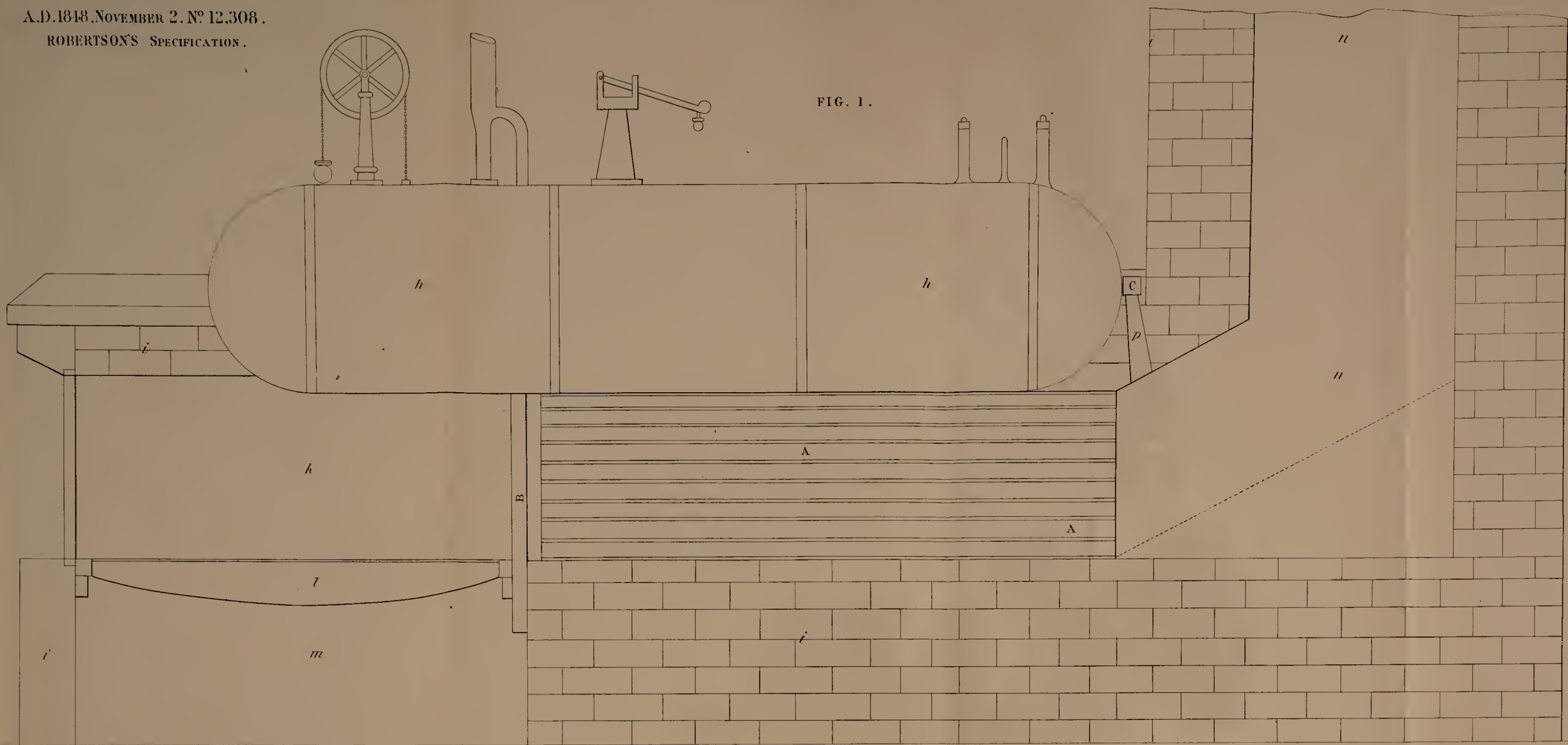


FIG. 9.

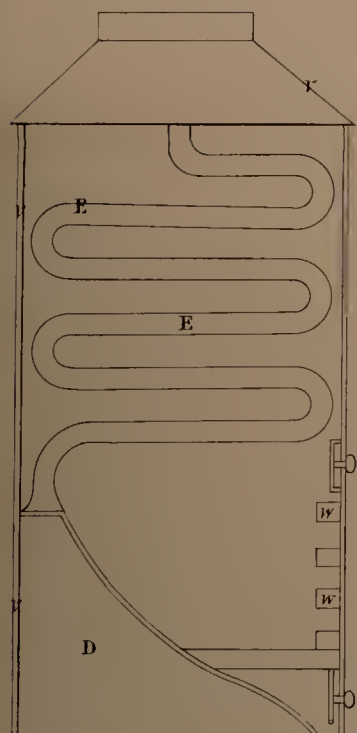


FIG. 2.

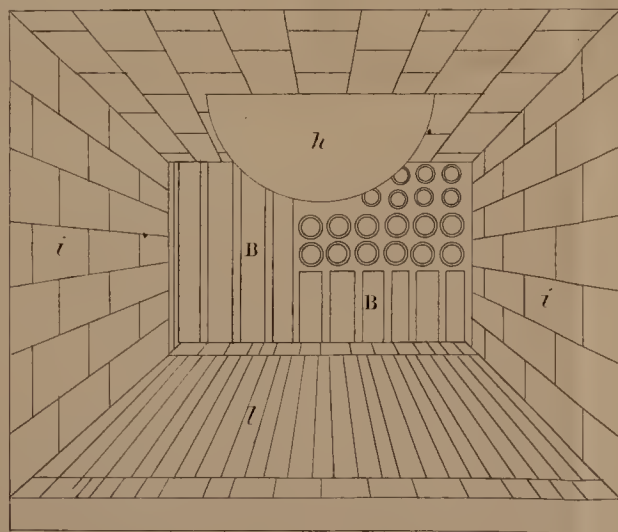


FIG. 3.

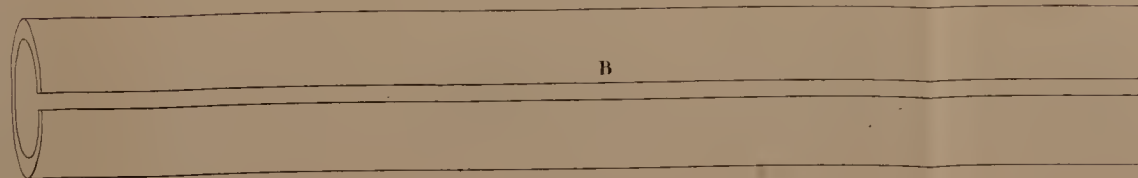


FIG. 5.

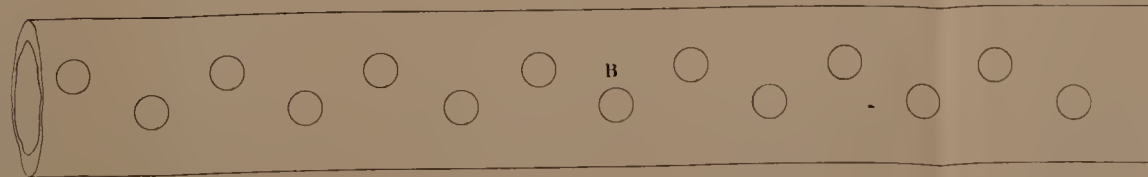


FIG. 4.

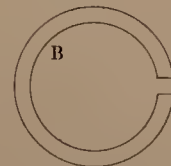


FIG. 6.

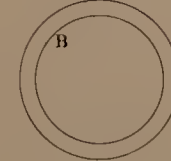


FIG. 10.

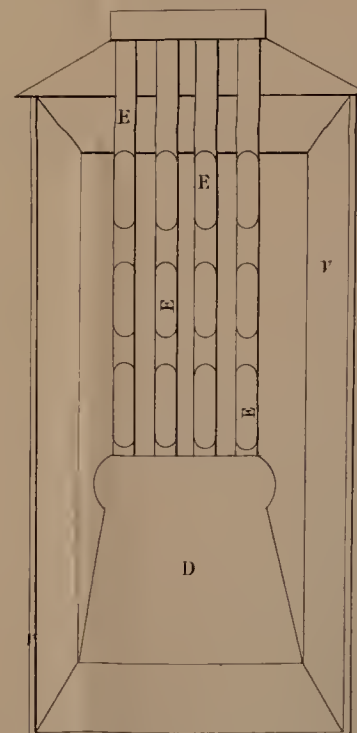
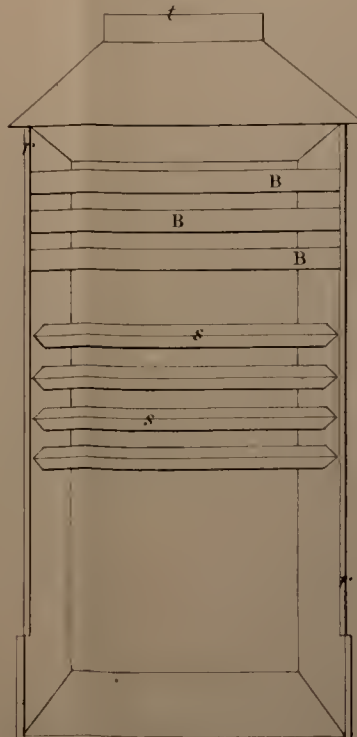


FIG. 8.



The Envelled Drawing is colored.





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having a chamber for collecting the noxious or offensive gaseous products before referred to, the said chamber communicating with a series of tubes, pipes, or passages, so bent and arranged in the stove as to obtain a considerable heating surface to be operated upon by the fuel  
5 used in the stove. And in these said last-mentioned Figures the corresponding parts are marked with similar letters or characters of reference. *v*, is the external casing or framework of the stove; *w*, bars; *D*, the chamber for collecting the noxious or offensive gaseous products; and *E*, the tubes, pipes, or passages communicating with the  
10 said chamber, and to be heated by the fuel used in the stove. The operation of the apparatus is as follows:—The heating of the tubes, pipes, or passages *E*, produces a current of the noxious or offensive gaseous products through them, and in their passage they become heated to a considerable extent; and it is found that this circumstance takes  
15 away from them their deleterious and unhealthy character, either completely or to a considerable extent. I would here observe, that the kind of stove lastly above described is particularly applicable to the foul air shafts of hospitals, and to be placed over the eyes or gratings of street sewers, in which case, if desired, the stove itself may be furnished with  
20 a suitable trap or valve in place of a trap or valve inserted in the paving or ground, as is ordinarily the case. And I would also further observe, that tubes or pipes similar to those marked *B*, and described more particularly under the second division of my Invention, may be disposed or arranged in the sewer stove in addition to the tubes, pipes,  
25 or passages *E*, being for the purpose of rendering more perfect the combustion of the fuel employed to heat the said tubes, pipes, or passages, in manner as described under the said second division.

Having now described the nature of my said Invention, and the manner in which the same is to be performed, I wish it to be distinctly  
0 understood that I am perfectly aware of the circumstance of tubes, pipes, &c. having been employed in a variety of ways for the introduction of air into furnaces, stoves, or other apparatus for consuming fuel, &c., and also for the passage or course of the smoke and other gaseous products and heated air, &c., in order to obtain a perfect combustion.  
35 I do not therefore claim the exclusive use of tubes, pipes, &c., or of

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any of the separate parts herein-before described or referred to, for the purpose of consuming smoke or other gaseous products, except when the same may be or are employed in connection with my said Invention, which I declare to consist of the three several parts herein-before set forth; and I therefore claim the mode or modes of consuming 5 smoke and other gaseous products arising from fuel and other substances, as herein set forth and as described.

In witness whereof, I, the said James Robertson, have hereunto set my hand and seal, this Second day of May, in the year of our Lord One thousand eight hundred and forty-nine. 10

JAMES (L.S.) ROBERTSON.

JEFFERSON. AND BE IT REMEMBERED, that on the Second day of May in the year of our Lord 1849, the aforesaid James Robertson came before our said Lady the Queen in Her Chancery, and acknowledged the Specification aforesaid, and all and every thing 15 therein contained and specified, in form above written. And also the Specification aforesaid was stamped according to the tenor of the Statute made for that purpose.

Enrolled the Second day of May, in the year of our Lord One thousand eight hundred and forty-nine. 20

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